Abstract

Taiwan's semiconductor industry has been prominent and ranks number four in the world. The vertical disintegration model of Taiwan's semiconductor is a very unique one among the integrated circuit industries around the world. The objective of this paper is to study the vertical disintegration management of Taiwan's semiconductor industries. A price model which there are both integrated (IDM) and unintegrated (IC foundry and IC fabless separated) firms was presented. A vertical disintegration model in which there is a Cournot–Nash equilibrium at both stages of production, upstream (IC design) and downstream (IC fabrication), has been proposed to explain analytically the market price changes subjected to vertical disintegration. It was suggested that the market price of the integrated circuit decreases if the numbers of IC fabless firms are more than half of the total IC firms and are more than the numbers of IC manufacturing firms. In addition, five non-price factors leading to the vertical disintegration of Taiwan's semiconductor industries have been proposed: (1) industrial localization and cluster, (2) fast changes of technology, (3) significant increase of development cost, (4) emergence of IC fabless, and (5) government support. By spinning off the equipment division which needs a high capital, the semiconductor company can actually make profits by concentrating more on the increasingly complex integrated circuit designs. The disintegrated foundry companies can provide advantages of more specialty, higher quality, lower cycle time and good cooperation relations for the IC fabless firms. The vertical disintegration of integrated circuits is expected to be the trend for future for semiconductor manufacturing. In addition, the future challenges and directions of Taiwan's semiconductor industries were also discussed.

Keywords: Integrated circuits ▪ vertical disintegration model ▪ price and non-price factors ▪ Taiwan ▪ foundry ▪ fabless ▪ Nash–Cournot equilibrium